April 22, 2008

From: David Schwab
To: Barry Wood

Re: Evaluation of Nexus's Claims

Summary

- Nexus' claim that horizontal equity has not been violated in Michigan Township in LaPorte County is invalid for two reasons:
  - (1) It is invalid to salvage a contradicted theory by means of additional, non-falsifiable hypotheses.
  - (2) The effect found—that disaggregated results in Michigan Township display a contrary relationship to the aggregate results—is likely the result of Simpson's Paradox, a well known statistical phenomenon.

Problem I: Ad Hoc Hypothesizing

The first problem with this claim is that it is invalid to salvage a contradicted theory by means of additional, non-falsifiable hypotheses. This is known as the *ad hoc* fallacy, and is accepted by the community of scientists as against good scientific practice.

The problem with ad hoc reasoning is that it is non-falsifiable. As the noted philosopher of science Sir Karl Popper noted, any theory may be salvaged by adding enough extra hypotheses. These hypotheses may be plausible: however, their addition to the theory *after* the theory has been disconfirmed in its initial form renders the theory non-falsifiable, and therefore unscientific.

To see this, suppose you tell me that you have the power to read minds. Doubting this, I ask you to prove it by telling me what color I am thinking of. I think of "yellow" and you answer "orange." I state that you are incorrect, and you claim that the negative energy created by my initially doubting you prevented you from being successful. The initial theory of "You can read minds" has now been revised, after its disconfirmation, to a new theory of "You can read minds if there is no negative energy around," thereby invalidating the initial negative result. This process can continue, as you fail to read my mind due to electrical pulses, the phases of the moon, and other factors, until we are both tired and go home. The point to notice is that because you can always add another hypothesis—such as "I can only read minds when the moon is full"—after the theory has been tested in its present form, you can always invalidate any test of theory.

This fallacy can be avoided in part if a generalized version of the new hypothesis is falsifiable. However, all else being equal, a simple, comprehensive theory is preferred to one that is constantly "corrected" via additional hypotheses. Indeed, this constant

correction usually signals the supercession of one theory by another, as Einstein's theory of general relativity replaced Newtonian mechanics.

Problem II: Simpson's Paradox

The second problem with this claim is that it runs afoul of Simpson's Paradox. This is a well-known statistical phenomenon where disaggregated data implies the opposite conclusion of aggregate data. The paradox is the result of omitting a variable which is correlated with other variables in the analysis; when this variable is added in, the paradox vanishes.

A famous example of Simpson's paradox is the sex discrimination lawsuit filed against the University of California at Berkeley in 1975. The aggregate data showed that men were admitted to the university at a much higher rate than women:

	Applicants	**Percent Admitted**
Men	8442	44%
Women	4321	35%

Table 1 Aggregate Percentage of Men and Women Admitted to UC Berkeley in 1975

However, the university countered that when this data was disaggregated by program, the bias disappeared:

Major	**Men**		**Women**	
	Applicants	% Admit.	Applicants	% Admit.
A	825	62%	108	82%
B	560	63%	25	68%
C	325	37%	593	34%
D	417	33%	375	35%
E	191	28%	393	24%
F	272	6%	341	7%

Table 2 Disaggregated Percentage of Men and Women Admitted to UC Berkeley in 1975, by Program of Study

The discrepancy is caused by the omission of a related variable: the fact that many women applied to programs with low admission rates, while men applied to programs with high admission rates.